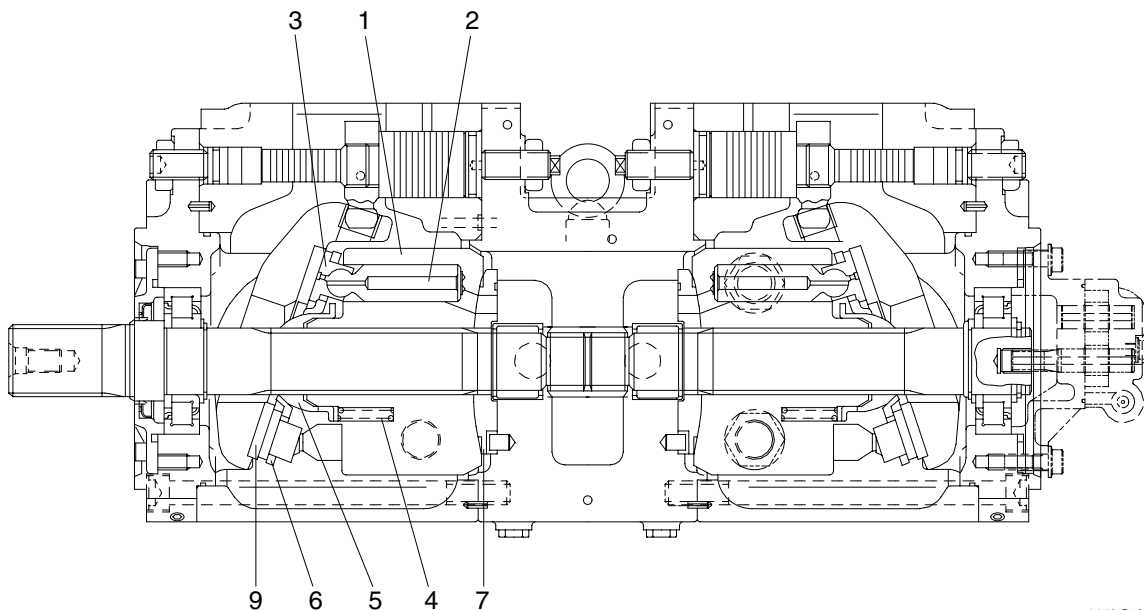


GROUP 2 MAJOR COMPONENT

1. MAIN PUMP




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Part name & inspection item		Standard dimension	Recommended replacement value	Counter measures
Clearance between piston(1) & cylinder bore(2) (D-d)		0.043	0.070	Replace piston or cylinder.
Play between piston(1) & shoe caulking section(3) (delta)		0-0.1	0.3	Replace assembly of piston & shoe.
Thickness of shoe (t)		5.4	5.0	
Free height of cylinder spring(4) (L)		47.9	47.1	Replace cylinder spring.
Combined height of set plate(5) & spherical bushing(6) (H-h)		23.8	22.8	Replace retainer or set plate.
Surface roughness for valve plate(Sliding face)(7,8), swash plate (shoe plate area)(9), & cylinder(2)(Sliding face)	Surface roughness necessary to be corrected	3z		Lapping
	Standard surface roughness (Corrected value)	0.4z or lower		

2. MAIN CONTROL VALVE

Part name	Inspection item	Criteria & measure
Casing	<ul style="list-style-type: none"> Existence of scratch, rusting or corrosion. 	<ul style="list-style-type: none"> In case of damage in following section, replace part. Sliding sections of casing fore and spool, especially land sections applied with holded pressure. Seal pocket section where spool is inserted. Seal section of port where O-ring contacts. Seal section of each relief valve for main, travel, and port. Other damages that may damage normal functions.
Spool	<ul style="list-style-type: none"> Existence of scratch, gnawing, rusting or corrosion. O-ring seal sections at both ends. Insert spool in casing hole, rotate and reciprocate it. 	<ul style="list-style-type: none"> Replacement when its outside sliding section has scratch(Especially on seals-contacting section). Replacement when its sliding section has scratch. Correction or replacement when O-ring is damaged or when spool does not move smoothly.
Poppet	<ul style="list-style-type: none"> Damage of poppet or spring Insert poppet into casing and function it. 	<ul style="list-style-type: none"> Correction or replacement when sealing is incomplete. Normal when it can function lightly without being caught.
Around spring	<ul style="list-style-type: none"> Rusting, corrosion, deformation or breaking of spring, spring seat, plug or cover. 	<ul style="list-style-type: none"> Replacement for significant damage.
Around seal for spool	<ul style="list-style-type: none"> External oil leakage. Rusting, corrosion or deformation of seal plate. 	<ul style="list-style-type: none"> Correction or replacement. Correction or replacement.
Main relief valve, port relief valve & negative control relief valve	<ul style="list-style-type: none"> External rusting or damage. Contacting face of valve seat. Contacting face of poppet. Abnormal spring. O-rings, back up rings and seals. 	<ul style="list-style-type: none"> Replacement. Replacement when damaged. Replacement when damaged. Replacement. 100% replacement in general.
Balance plate	<ul style="list-style-type: none"> Worn less than 0.03mm Worn more than 0.03mm Sliding surface has a seizure(Even through small). 	<ul style="list-style-type: none"> Lapping Replace Replace

3. SWING DEVICE

Part name	Inspection item	Remedy
Shoe of piston assembly	<ul style="list-style-type: none"> · Sliding surface has a damage. · Sliding surface depression() dimension less than 0.45mm or has a large damage. 	<ul style="list-style-type: none"> · Lapping · Replace parts or motor
Piston of piston assembly	<ul style="list-style-type: none"> · Sliding surface has a seizure(Even though small). 	<ul style="list-style-type: none"> · Replace motor
Piston hole of cylinder assembly	<ul style="list-style-type: none"> · Sliding surface has a seizure. · Sliding surface has a damage. 	<ul style="list-style-type: none"> · Replace motor · Replace motor
Taper roller bearing Needle bearing Roller bearing	<ul style="list-style-type: none"> · In case 3000hour operation. · Rolling surface has a damage. 	<ul style="list-style-type: none"> · Replace · Replace

4. TRAVEL MOTOR

The followings are the general maintenance standards. However, it is the most important to determine which parts should be replaced, depending on the characteristics before disassembling, damages and discoloration of exterior view, the purpose of disassembling, the expected remaining service life. etc..

Item	Check item	Measuring method	Criteria	Allowable	Remedy
Cylinder block, valve plate, swash plate ※ Lap together the surfaces of both cylinder block and valve plate to remedy their roughness	Surface roughness of cylinder block of valve plate and swash plate	Measure the surface roughness by roughness tester	Below 0.4Z μ	Below 0.4Z μ	Replace or repair
	Swash plate	Measure the surface hardness of swash plate by hardness tester	Over HS78	HS74	Replace
Clearance between piston and cylinder block ※ In exchanging pistons, replace all of nine pistons at the same time	Outer dia of piston d max - d min	Measure outer dia of piston and bore of cylinder block at least 3 places in the longitudinal direction with micrometer and obtain (max outer dia = d max min outer dia = d min max inner dia = D max min inner dia = D min)	0.01mm	0.05mm	Replace piston or cylinder block
	Inner dia of cylinder bore D max - D min		0.01mm	0.022mm	
	Clearance D-d		0.037~ 0.047mm	0.065mm	
Play between piston and shoe	Play between calked piston and shoe(δ)	With the jig of figure C, hold down the shoe on work stand and pull up the piston vertical direction to measure the play between piston and shoe	0~0.1mm	0.3mm	Replace piston
Negative brake torque	Parking brake torque	After completion of assembly, set the torque wrench on the shaft end, and measure the braking torque generated when the shaft starts to rotate	78.8kgf · m (570lbf · ft)	70.9kgf · m (513lbf · ft)	Replace all separator and friction plates and springs

Item	Measuring method	Judging criteria and remedy
Saft	Measure the wear at contacting surface of oil seal(26) with the surface roughness tester	If the depth of shaft wear is less than 0.05mm, the shaft is reusable. ※ In case of replacing the shaft(9), replace oil seal (26) at the same time.
Bearings	Replace bearings(30, 31) before hour meter of host machine indicates 10,000hours	※ In case replacing the bearings(30, 31), replace both inner and outer races at the same time. ※ Also the bearing shims(33) must be readjusted when replaced shaft(9) and/or bearings(30, 31). Contact dealers for jigs and tools required.
Splines	Replace if the wear of splines exceeds the allowable value	※ If the wear of splines is less than 0.3mm, the spline is reusable.
Overload relief valve part	Do not try to adjust the valve, since special hydraulic test bench is required for inspecting and adjusting the pressure	Replace relief valve part as an assembly each time the host machine works for 10,000 hours.

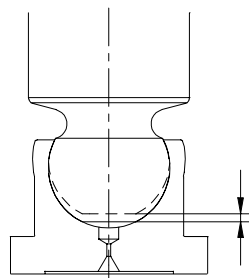


Figure A
Play

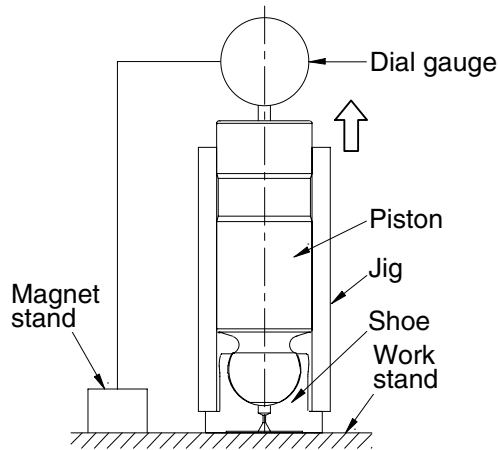


Figure B
Method

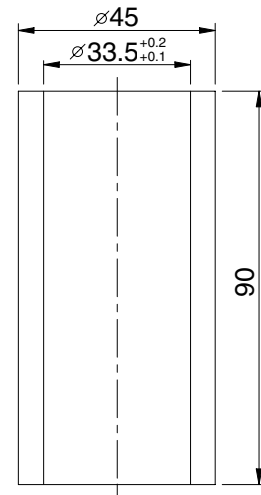


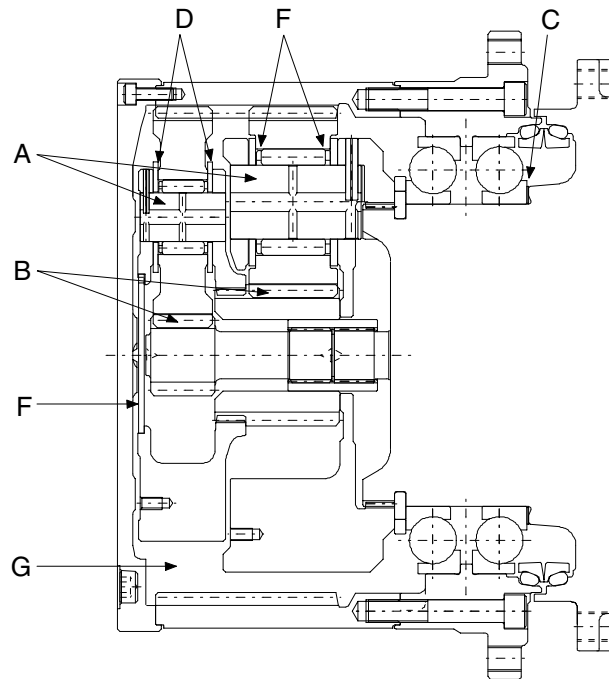
Figure C
Jig for measuring play

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5. TRAVEL REDUCTION GEAR

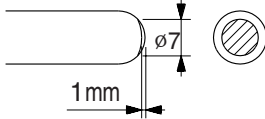
The followings are the general maintenance standards. However, it is most important to determine which parts should be replaced, depending on the characteristics shown before disassembling, damages or discoloration of exterior view, the purpose of disassembling, the expected remaining service life etc..

Item	Part name	Criteria	Allowable limit	Remedy
A	Wear of planetary shaft	Smooth, without abnormal wear or seizure	←	Change 3 pieces as a set
B	Condition of tooth surface	Smooth, without abnormal wear or seizure	1.6 of pitching, no cracks at root	Change 3 pieces as a set for planet pinion
C	Thrust clearance of angular bearings	From : -0.08mm To : 0.02mm	←	Adjust shim Refer to 8-81(6)
D	Thickness of thrust washer 1(5)	$2.7 \pm 0.2\text{mm}$	Wear 0.1mm	Replace
E	Thickness of thrust washer 2(16)	$3.2 \pm 0.2\text{mm}$	Wear 0.1mm	Replace
F	Thickness of thrust plate(8)	$4.5 \pm 0.16\text{mm}$	Wear 0.15mm	Replace
G	Lubrication oil	2000 Working hours(Hour meter)		Exchange



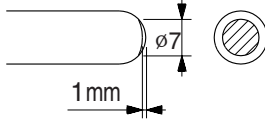
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6. RCV LEVER

Maintenance check item	Criteria	Remark
Leakage	The valve is to be replaced when the leakage becomes more than 1000cc/m at neutral handle position, or more than 2000cc/m during operation.	Conditions : Primary pressure : 30kgf/cm ² Oil viscosity : 23cSt
Spool	This is to be replaced when the sliding surface has worn more than 10 μm, compared with the non-sliding surface.	The leakage at the left condition is estimated to be nearly equal to the above leakage.
Push rod	 <p>This is to be replaced when the top end has worn more than 1mm.</p>	
Play at operating section	The pin, shaft, and joint of the operating section are to be replaced when their plays become more than 2mm due to wears or so on.	When a play is due to looseness of a tightened section, adjust it.
Operation stability	When abnormal noises, hunting, primary pressure drop, etc. are generated during operation, and these cannot be remedied, referring to section 6. Troubleshooting, replace the related parts.	

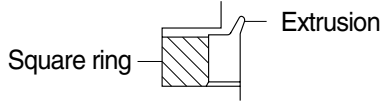
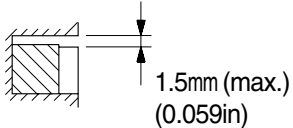
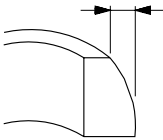
- Notes
1. It is desirable to replace seal materials, such as O-rings, every disassembling. However, they may be reused, after being confirmed to be free of damage.
 2. When loosening the hexagon socket head cap screw(125), replace the seal washers(121) without fail.

7. RCV PEDAL

Maintenance check item	Criteria	Remark
Leakage	The valve is to be replaced when the leakage effect to the system. For example, the primary pressure drop.	Conditions : Primary pressure : 30kgf/cm ² Oil viscosity : 23cSt
Spool	This is to be replaced when the sliding surface has worn more than 10 μm, compared with the non-sliding surface.	The leakage at the left condition is estimated to be nearly equal to the above leakage.
Push rod	 <p>This is to be replaced when the top end has worn more than 1mm.</p>	
Play at operating section	The pin, shaft, and joint of the operating section are to be replaced when their plays become more than 2mm due to wears or so on.	When a play is due to looseness of a tightened section, adjust it.
Operation stability	When abnormal noises, hunting, primary pressure drop, etc. are generated during operation, and these cannot be remedied, referring to section 6. Troubleshooting, replace the related parts.	

Notes 1. It is desirable to replace seal materials, such as O-rings, every disassembling. However, they may be reused, after being confirmed to be free of damage.

8. TURNING JOINT

Part name		Maintenance standards	Remedy
Body, Stem	Sliding surface with sealing sections.	Plating worn or peeled due to seizure or contamination.	Replace
	Sliding surface between body and stem other than sealing section.	• Worn abnormality or damaged more than 0.1mm (0.0039in) in depth due to seizure contamination.	Replace
		• Damaged more than 0.1mm(0.0039in) in depth.	Smooth with oilstone.
	Sliding surface with thrust plate.	• Worn more than 0.5mm(0.02in) or abnormality.	Replace
• Worn less than 0.5mm(0.02in).		Smooth	
• Damage due to seizure or contamination remediable within wear limit (0.5mm)(0.02in).		Smooth	
Cover	Sliding surface with thrust plate.	• Worn more than 0.5mm(0.02in) or abnormality.	Replace
		• Worn less than 0.5mm(0.02in).	Smooth
		• Damage due to seizure or contamination remediable within wear limit (0.5mm)(0.02in).	Replace
Seal set	-	<ul style="list-style-type: none"> • Extruded excessively from seal groove square ring. 	Replace
	-	<ul style="list-style-type: none"> • Slipper ring 1.5mm(0.059in) narrower than seal groove, or narrower than back ring. 	Replace
	-	<ul style="list-style-type: none"> • Worn more than 0.5mm(0.02in) ~ 1.5mm(MAX.) (0.059in) 	Replace

9. CYLINDER

Part name	Inspecting section	Inspection item	Remedy
Piston rod	· Neck of rod pin	· Presence of crack	· Replace
	· Weld on rod hub	· Presence of crack	· Replace
	· Stepped part to which piston is attached.	· Presence of crack	· Replace
	· Threads	· Presence of crack	· Recondition or replace
	· Plated surface	· Plating is not worn off to base metal.	· Replace or replate
		· Rust is not present on plating. · Scratches are not present.	· Replace or replate · Recondition, replate or replace
	· Rod	· Wear of O.D.	· Recondition, replate or replace
· Bushing at mounting part	· Wear of I.D.	· Replace	
Cylinder tube	· Weld on bottom	· Presence of crack	· Replace
	· Weld on head	· Presence of crack	· Replace
	· Weld on hub	· Presence of crack	· Replace
	· Tube interior	· Presence of faults	· Replace if oil leak is seen
	· Bushing at mounting part	· Wear on inner surface	· Replace
Gland	· Bushing	· Flaw on inner surface	· Replace if flaw is deeper than coating